GETTING STARTED

A Guide for New Users

8840A/ 8842A

DIGITAL MULTIMETERS

FLUKE®

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8840A/ 8842A

DIGITAL MULTIMETERS

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THIS MANUAL introduces you to the Fluke 8840A and 8842A Digital Multimeters and gives a brief introduction to remote programming using the IEEE-488 Interface option.

For more complete operating and programming instructions, please refer to the Instruction Manual.

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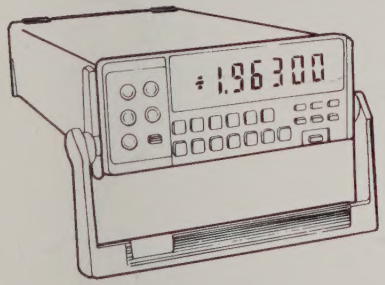
THE 8840A DIGITAL MULTIMETER



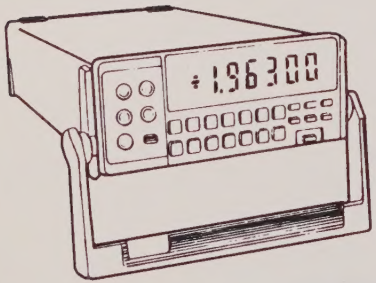
The 8840A sets new standards for low-cost 5-1/2 digit multimeters in accuracy, speed, and ease of use. With its IEEE-488 Interface option, the 8840A is the most capable system instrument in its class.

Features of the 8840A include:

- Highly legible vacuum fluorescent display
- Intuitively easy front panel operation
- Basic dc accuracy of 0.005% for 1 year
- 2-wire and 4-wire resistance measurement
- DC current measurement
- Up to 100 readings per second
- Closed-case calibration (No internal adjustments)
- Built-in self-tests

Options, which can be installed at any time, include the IEEE-488 Interface (Option -05) and the True RMS AC (Option -09), which lets you measure ac voltage and current.

THE 8842A DIGITAL MULTIMETER



The 8842A is the top-of-the-line DMM in the 8840A family. Using proprietary thin film resistor networks, a stable reference amplifier and stable active components, the 8842A offers superior measurement performance and stability. It also offers additional 20 mV, 20 ohm and 200 mA dc ranges.

Features of the 8842A include:

- Highly legible vacuum fluorescent display
- Intuitively easy front panel operation
- Basic dc accuracy of 0.003% for 1 year
- 2-wire and 4-wire resistance measurement
- DC current measurement
- Up to 100 readings per second
- Closed-case calibration (No internal adjustments)
- Built-in self-tests

Options, which can be installed at any time, include the IEEE-488 Interface (Option -05) and the True RMS AC (Option -09, which lets you measure ac voltage and current).

SETTING UP THE DMM

Connecting to Line Power

WARNING

TO AVOID SHOCK HAZARD, CONNECT THE INSTRUMENT POWER CORD TO A POWER RECEPTACLE WITH EARTH GROUND.

To avoid instrument damage, check that the rear-panel line voltage selection switches are set to the power-line voltage in your area. (See below.) For fire protection with power-line voltages from 198V to 250V, replace the rear panel 1/4A, 250V slo-blo fuse with a 1/8A, 250V slo-blo fuse.

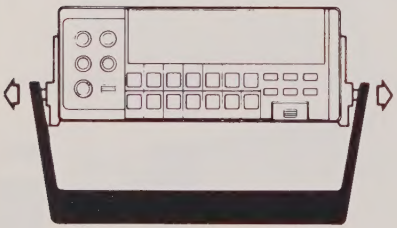
FOR THIS LINE VOLTAGE:	USE THIS SWITCH SETTING:	FOR THIS LINE VOLTAGE:	USE THIS SWITCH SETTING:
90V to 109V		198V to 229V	
109V to 132V		229V to 250V	

SETTING UP THE DMM

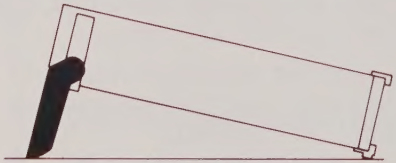
Adjusting the Handle

The handle provides two viewing angles for bench-top use. To adjust its position, pull the ends out to a hard stop (about 1/4 on inch each side) and rotate it to one of the four stop positions shown below. To remove the handle, adjust it to the vertical stop position and pull the ends all the way out.

PULL ENDS OUTWARD
TO ROTATE

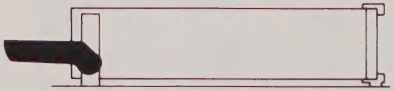


1. Viewing position

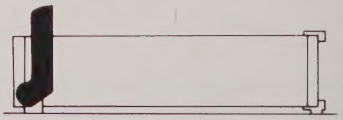


2. Alternate viewing position

3. Carrying position

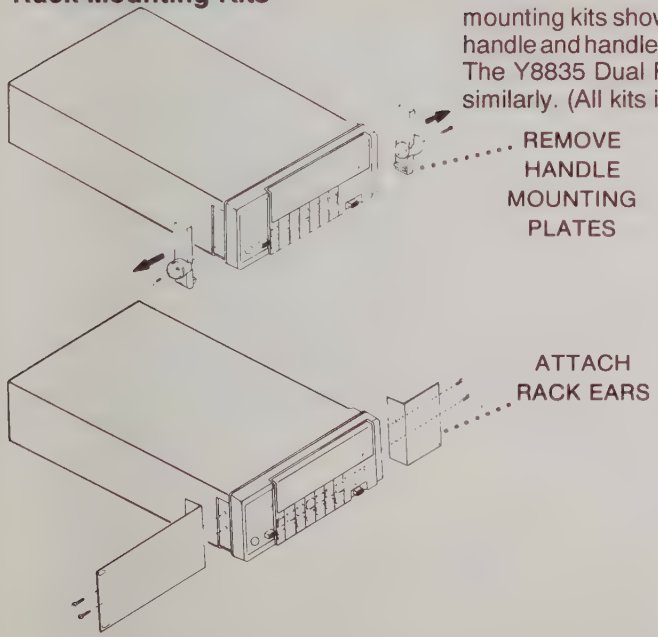


4. Removal position
(to remove, pull ends out)

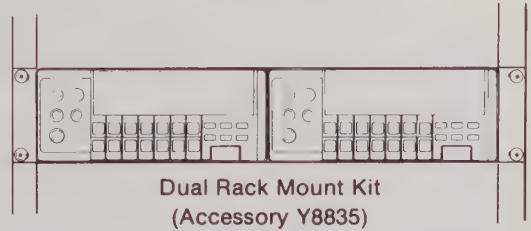


Rack Mounting Kits

You can mount the DMM in a standard 19-inch rack panel using the accessory rack mounting kits shown below. To install the Y8834 Single Rack Mount Kit, remove the handle and handle mounting plates, and attach the rack ears with the screws provided. The Y8835 Dual Rack Mount Kit and Y8836 Center Rack Mount Kit are installed similarly. (All kits include mounting instructions.)



Single Rack Mount Kit
(Accessory Y8834)



Dual Rack Mount Kit
(Accessory Y8835)

POWER-UP

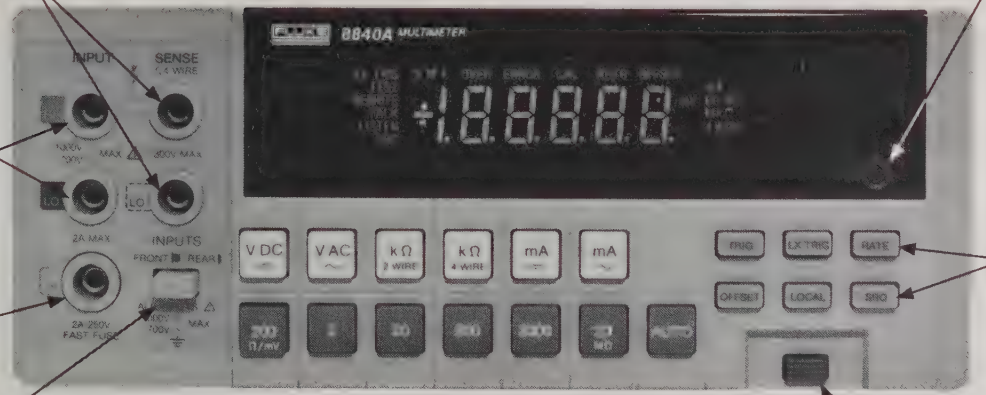
Power-Up Self-Test

When the DMM is turned on, all display segments light up for about 2 seconds while the instrument performs an internal self-test. The DMM then assumes the following configuration:

- VDC function
- Autorange, starting in the 1000V range
- Slow reading rate
- Continuous, internal trigger
- OFFSET off
- Local (front panel) control

During the power-up self-test, you can freeze the display by pressing the SRQ button while the display is lit. All display segments will then remain lit until you press any button.

THE 8840A FRONT PANEL



FUNCTION BUTTONS

VDC	VDC	kΩ 2 WIRE	2-Wire Ohms	mA	DC Current
VDC ~	VAC*	kΩ 4 WIRE	4-Wire Ohms	mA ~	AC Current*

HI and LO SENSE Terminals

HI and LO INPUT Terminals

2A INPUT Terminal (Houses 2A fuse)

FRONT/REAR switch selects either front or rear inputs.

CAL ENABLE switch enables calibration mode. (CAUTION See Instruction Manual)

Special Features

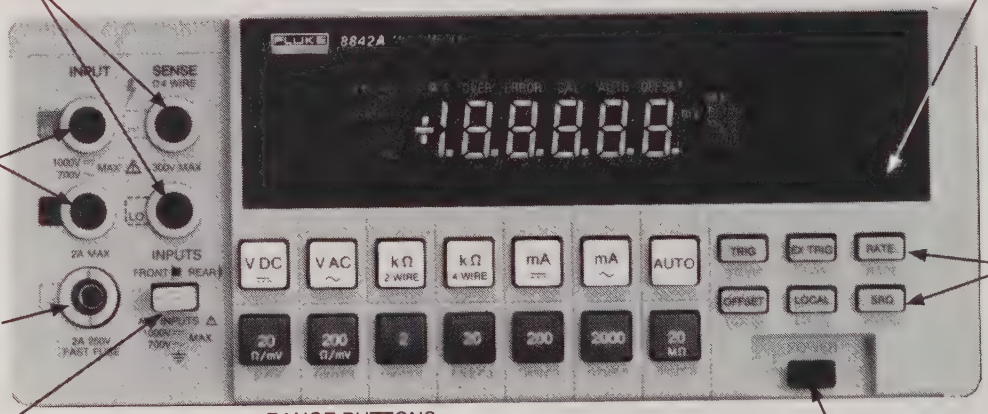
POWER switch turns 8840A on or off. Also initiates power-up self-test and resets instrument.

RANGE BUTTONS

200 Ω/mV	200 mV or 200Ω	2000	1000V dc, 700V ac, 2 MΩ, or 2000 mA
2	2V or 2 kΩ		
20	20V or 20 kΩ	20 MΩ	20 MΩ
200	200V or 200 kΩ	AUTO	Autorange On/Off

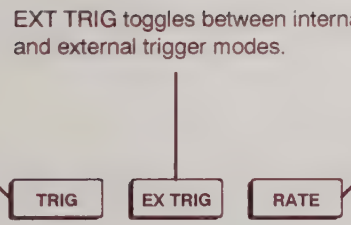
* Available with True RMS AC only. Gives error message if option not installed.

THE 8842A FRONT PANEL



* Available with 8842A-09 True RMS AC option only. Gives error message if not installed.

SPECIAL FEATURES



EXT TRIG toggles between internal and external trigger modes.

TRIG triggers a new reading. Enabled in external trigger mode.

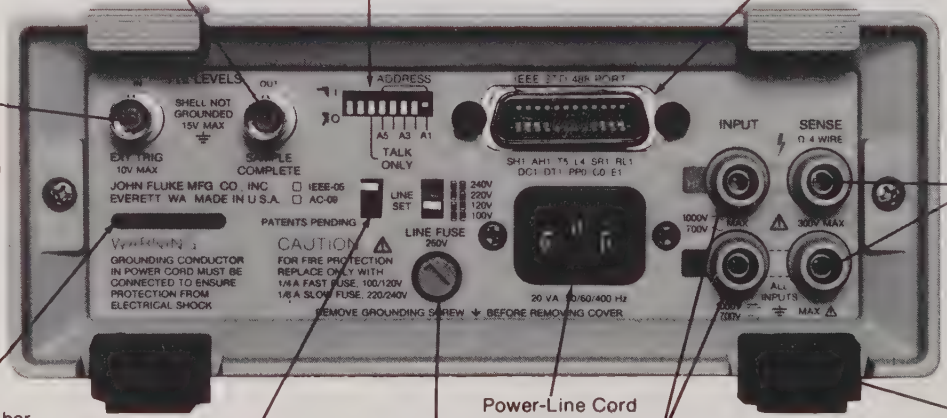
RATE cycles between slow, medium and fast reading rates. Automatically selects the optimum filter.

OFFSET stores the displayed reading as an offset, which the DMM subtracts from all subsequent readings in the function presently selected. Readings in the other functions remain unaffected. Pressing OFFSET again cancels the offset, or stores a new offset if in a different function.

SRQ generates a service request over the IEEE-488 bus if enabled by the SRQ mask (IEEE-488 Interface option only). When pressed for 3 seconds, SRQ initiates diagnostic self-tests. NOTE: Leave inputs disconnected during self-tests or the DMM may indicate errors.

If the DMM is in remote, LOCAL returns it to local control. If the DMM is in local, the LOCAL button displays the DMM bus address for one second. Ignored if the IEEE-488 Interface is not installed.

THE REAR PANEL

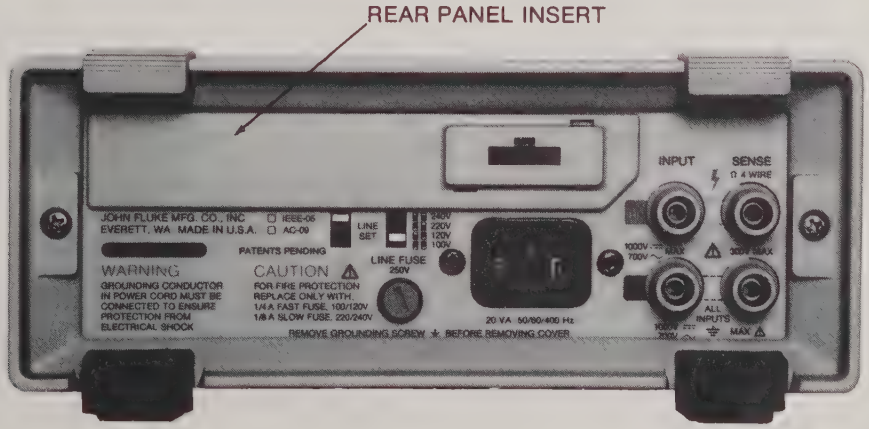

SAMPLE COMPLETE output*
TTL-level. Normally high, pulsed low when samples for a reading are completed.
TALK ONLY and IEEE-488 ADDRESS Selection Switches*
IEEE-488 Interface Bus Connector*
EXT TRIG input*.
TTL-level,
falling-edge triggered.
(Internally selectable.)
HI and LO SENSE Terminals
Serial Number
Line Voltage Selection Switches
Power-Line Fuse
Power-Line Cord Connector
HI and LO INPUT Terminals
Rear feet rotate for rack mounting
*Available only with IEEE-488 Interface

THE REAR PANEL

If your 8840A does not have the IEEE-488 Interface, the upper portion of the rear panel is covered by an insert as shown below. Do not remove the insert unless you are adding the IEEE-488 Interface.

CAUTION

The rear panel insert is attached from inside the case. Refer to the 8840A Instruction Manual for instructions on removing it.

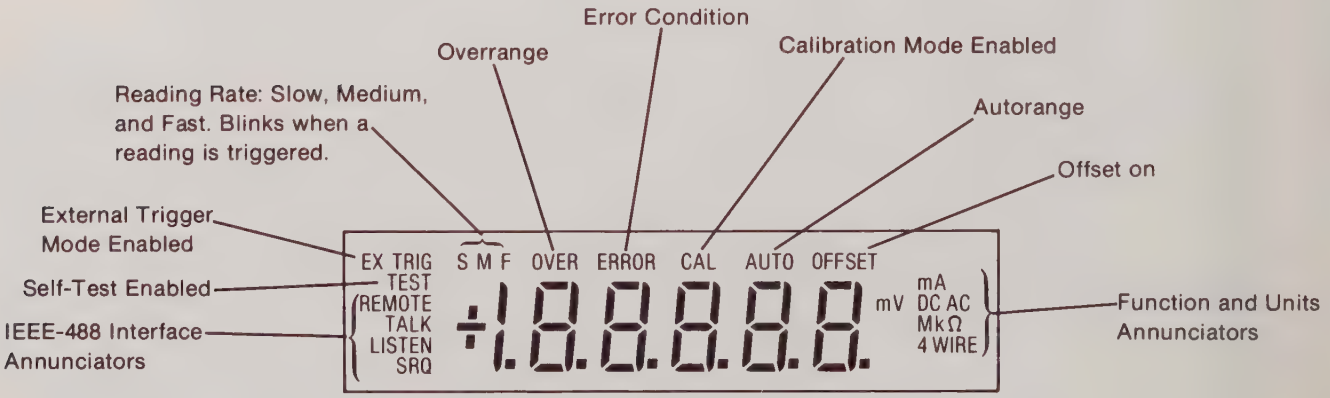


THE DISPLAY

The Display

The vacuum fluorescent display indicates explicit units for all functions and ranges, so you never have to interpret readings.

When the DMM is in the external trigger (EX TRIG) mode, pressing any front panel button blanks the numeric field in the display until a new measurement is triggered. This ensures that all readings correspond to the instrument configuration indicated by the display annunciators.



Overrange Indication

In most ranges the DMM indicates the input is overrange as shown below. The sign and the position of the decimal point depend on the function and range.

As a safety feature, the DMM treats the 1000V dc and 700V ac ranges differently. In these ranges, the DMM indicates when the input exceeds the input overload limit of 1000V dc or 700V ac, respectively, by lighting the OVER annunciator and flashing the display. Readings are still displayed.

THE DISPLAY

Error Messages

If the DMM detects an error, it displays an error message for about 2-1/2 seconds and then resumes normal operation. During this time, the front panel buttons are ignored. The error message consists of the ERROR annunciator and a two-digit error code. Error codes are explained on the next page.

If the FRONT/REAR switch is set to the REAR position while the mA DC or mA AC function is selected, error 31 is displayed. In this case the error message is displayed until you return the switch to the FRONT position or select another function.

When you run the diagnostic self-tests (which are initiated by pressing the SRQ button for 3 seconds), be sure the input terminals are disconnected. Otherwise, the DMM may display some of the self-test errors (errors 01 to 29).

If the DMM displays self-test errors even when the input terminals are disconnected, there may be a hardware problem in your DMM. In that event, refer to the DMM Instruction Manual or contact your local Fluke representative.

Error 30: AC function selected without True RMS AC Converter option.

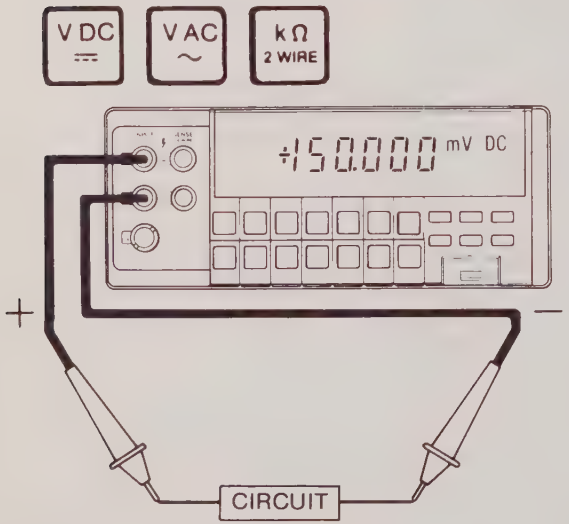
Error Codes

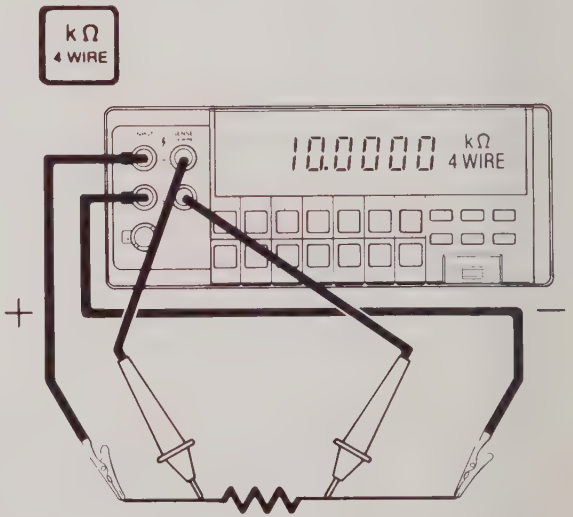
ERROR CODE	MEANING
	SELF-TEST ERRORS
01-29	See Instruction Manual.
	OPERATION ERRORS
30	AC functions available only with -09 True RMS AC option.
31	mA AC or mA DC function selected while REAR inputs selected.
32	OFFSET selected with reading unavailable or overrange.
40	Computed calibration constant out of range.
41	Calibration input out of acceptable range.
42	Calibration Memory write error.
50	Guard crossing error detected by In-Guard μC.
51	Calibration command not valid unless calibration mode is enabled.
52	Command not valid at this time. Check whether DMM is in cal mode and if so which part of the cal procedure it is in.
53	Invalid calibration value in Put command. (Example: Sending a negative value during ac calibration.)
54	Command not valid in calibration verification.
56	Variable inputs not allowed during A/D calibration. Use prompted value.
60	Device-dependent commands not valid during self-test.
71	Syntax error in device-dependent command string.
72	Guard crossing error detected by Out-Guard μC.
77	IEEE-488 Interface self-test error.

MAKING MEASUREMENTS

Voltage and Resistance

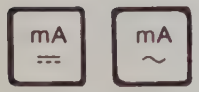
To measure voltage or resistance, select the desired function and connect the test leads as shown. Resistance can be measured in either the 2-wire or 4-wire configuration.





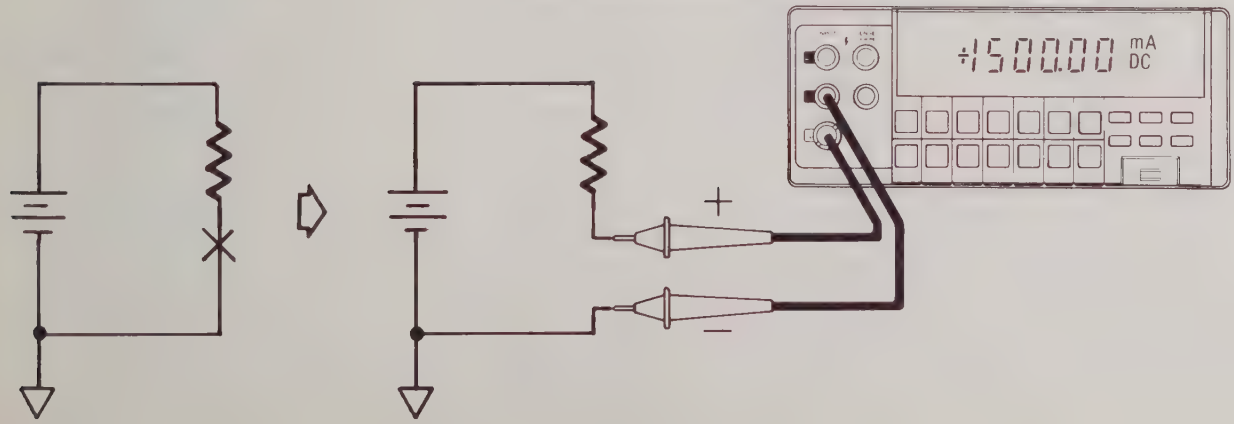
MAKING MEASUREMENTS

Current



To measure current, select the desired function and connect the test leads as follows:

1. Turn off power in the circuit to be measured.
2. Break the circuit (preferably on the ground side to minimize the common mode voltage), and place the DMM in series at that point.
3. Turn on power in the circuit, and read the display.
4. Turn off power in the circuit, and disconnect the DMM.



MAKING MEASUREMENTS

Offset Measurements

WARNING

WHEN THE OFFSET FEATURE IS IN USE, DISPLAYED READINGS ARE RELATIVE AND MAY NOT INDICATE THE PRESENCE OF DANGEROUS POTENTIALS AT THE INPUT CONNECTORS OR TEST LEADS. USE CAUTION TO AVOID ELECTRIC SHOCK OR INSTRUMENT DAMAGE.

The OFFSET button stores a reading so that you can make relative measurements. When an offset is in use, the display always has a + or - sign (even in the resistance and ac functions) since the reading represents a numeric difference.

Ranges and Reading Rates

The range buttons select among the available measurement ranges as shown on page 11 or 12. Select the slow (S) reading rate to minimize the effect of noise. Select the medium (M) or fast (F) reading rate for higher measurement speed.

RANGE SELECTION AND READING RATES

RANGE	SELECTION METHOD	READING RATE (readings per second)		
		S	M	F
20 mV dc, 20Ω, and 200 mA dc ranges*	Select the range.	0.31*	1.25*	100*
All other ranges	Select the range or autorange.	2.50	20	100

** 8842A only*

Overload Protection Limits

WARNING

TO AVOID SHOCK HAZARD AND/OR INSTRUMENT DAMAGE, DO NOT APPLY INPUT POTENTIALS THAT EXCEED THE OVERLOAD PROTECTION LIMITS SHOWN BELOW.

INPUT OVERLOAD PROTECTION LIMITS

FUNCTION	CONNECTORS	MAXIMUM INPUT
VDC	INPUT HI and LO:	1000V dc
mA DC	2A INPUT and INPUT LO:	2000 mA
2 WIRE/4 WIRE kΩ	INPUT HI and LO: SENSE HI and LO:	300V rms 300V rms
VAC	INPUT HI and LO:	700V rms, 1000V peak or 2×10^7 V-Hz (whichever is less)
mA AC	2A INPUT and INPUT LO:	2000 mA rms
All Functions	Any terminal to earth:	1000V dc or peak ac

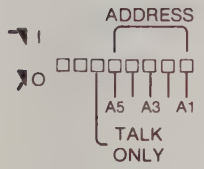
REMOTE OPERATION

The IEEE-488 Interface

The IEEE-488 Interface option turns the DMM into a fully programmable systems instrument for remote operation over the IEEE Standard 488-1978 interface bus.

The DMM can be under complete, interactive control from a remote bus controller. Or when set to the talk-only mode, the DMM can be connected to a printer or data logger and dedicated to a single task.

Connecting to the IEEE-488 Interface



To set up the DMM on the IEEE-488 bus,

1. Set the IEEE-488 address using the rear panel IEEE-488 ADDRESS switches (see next page).

2. Plug an IEEE-488 cable into the rear panel IEEE-488 connector, secure it, and connect the cable to one of the other instruments in your system.

3. Switch on the DMM.

Whenever the DMM is under local control, its IEEE-488 address can be displayed on the front panel by pressing the LOCAL button. The address is displayed with a minus sign if the DMM is set to the talk-only mode.

REMOTE OPERATION

REAR PANEL ADDRESS SETTINGS

ADDRESS	TALK ONLY	A5	A4	A3	A2	A1
00	0	0	0	0	0	0
01	0	0	0	0	0	1
02	0	0	0	0	1	0
03	0	0	0	0	1	1
04	0	0	0	1	0	0
05	0	0	0	1	0	1
06	0	0	0	1	1	0
07	0	0	0	1	1	1
08	0	0	1	0	0	0
09	0	0	1	0	0	1
10	0	0	1	0	1	0

ADDRESS	TALK ONLY	A5	A4	A3	A2	A1
11	0	0	1	0	1	1
12	0	0	1	1	0	0
13	0	0	1	1	0	1
14	0	0	1	1	1	0
15	0	0	1	1	1	1
16	0	1	0	0	0	0
17	0	1	0	0	0	1
18	0	1	0	0	1	0
19	0	1	0	0	1	1
20	0	1	0	1	0	0
21	0	1	0	1	0	1

ADDRESS	TALK ONLY	A5	A4	A3	A2	A1
22	0	1	0	1	1	0
23	0	1	0	1	1	1
24	0	1	1	0	0	0
25	0	1	1	0	0	1
26	0	1	1	0	1	0
27	0	1	1	0	1	1
28	0	1	1	1	0	0
29	0	1	1	1	0	1
30	0	1	1	1	1	0
31	Not allowed					
TALK ONLY	1	X	X	X	X	X
	X = setting does not matter					

REMOTE OPERATION

Talk-Only Mode

The talk-only mode lets you take advantage of the remote capability of the DMM without having to use an instrument controller. To put the DMM in the talk-only mode:

1. Turn the DMM POWER switch OFF.
2. Set the rear panel TALK ONLY bit switch to 1 (the up position).
3. Connect the DMM via the IEEE-488 bus to your printer, data logger, or other device.
4. Configure the other device as a listener only.
5. Turn the DMM POWER switch ON.

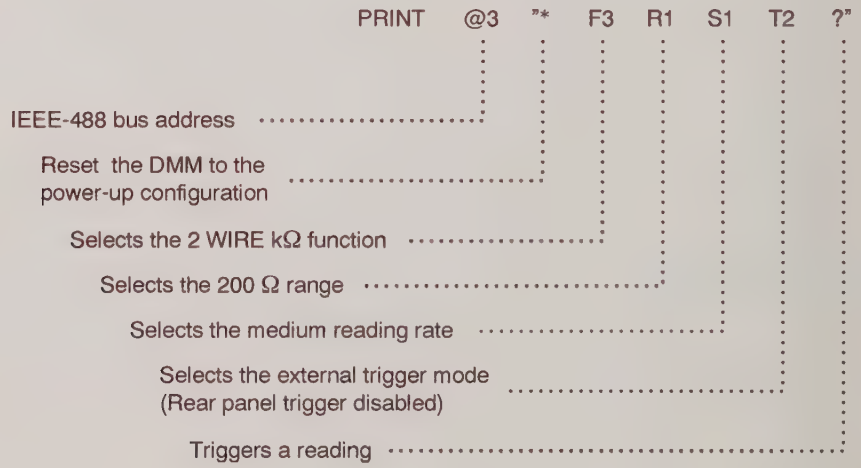
Remote Programming

The DMM device-dependent command set makes remote operation much like front panel operation. The following pages show the device-dependent commands that correspond directly to the front panel. For complete programming instructions, including a complete list of device-dependent commands, refer to the Instruction Manual.

REMOTE OPERATION

Typical Command String

Here is a typical command string as it might be sent from a Fluke 1722A Instrument Controller. The string configures the DMM and triggers a reading. The PRINT command automatically sends terminators (CR, LF, and/or EOI) to the DMM at the end of the command string.



8840A Remote Commands

DISPLAY COMMANDS
D0 Normal Display
D1 Blank Display

TRIGGER COMMANDS
? Trigger Measurement
GET Trigger and Execute

SUFFIX COMMANDS
Y0 Disable Suffix
Y1 Enable Suffix

TRIGGER MODE COMMANDS
T0 Continuous Trigger
T1-T4 External Trigger

READING RATE COMMANDS
S0 Slow
S1 Medium
S2 Fast

Sensed by G5

FUNCTION COMMANDS
F1 VDC
F2 VAC
F3 2 WIRE kΩ
F4 4 WIRE kΩ
F5 mA DC
F6 mA AC

RANGE COMMANDS
R0 Autorange On
R1 200 mV, 200Ω
R2 2V, 2 kΩ
R3 20V, 20 kΩ
R4 200V, 200 kΩ
R5 1000V dc, 700V ac, 2 MΩ, 2000 mA
R6 20 MΩ
R7 Autorange Off

OFFSET COMMANDS
B0 Offset Off
B1 Offset On

GTL Go To Local

DEVICE-CLEAR COMMAND
* Reset 8840A to power-up state

SELF-TEST COMMAND
Z0 Begin Self-Tests

*See the 8840A Instruction Manual for a complete list of commands.

8842A Remote Commands

DISPLAY COMMANDS
D0 Normal Display
D1 Blank Display

TRIGGER COMMANDS
? Trigger Measurement
GET Trigger and Execute

SUFFIX COMMANDS
Y0 Disable Suffix
Y1 Enable Suffix

TRIGGER MODE COMMANDS
T0 Continuous Trigger
T1-T4 External Trigger

READING RATE COMMANDS
S0 Slow
S1 Medium
S2 Fast

Sensed by G5

FUNCTION COMMANDS
F1 VDC
F2 VAC
F3 2 WIRE kΩ
F4 4 WIRE kΩ
F5 mA DC
F6 mA AC

RANGE COMMANDS
R0 Autorange On
R1 200 mV, 200Ω
R2 2V, 2 kΩ
R3 20V, 20 kΩ
R4 200V, 200 kΩ, 200 mA dc
R5 1000V dc, 700V ac, 2 MΩ, 2000 mA
R6 20 MΩ
R7 Autorange Off
R8 20 mV dc, 20Ω

OFFSET COMMANDS
B0 Offset Off
B1 Offset On

SELF-TEST COMMAND
Z0 Begin Self-Tests

GTL Go To Local

DEVICE-CLEAR COMMAND
* Reset 8842A to power-up state

*See the 8842A Instruction Manual for a complete list of commands.

Programming Example

The following program was written in Fluke BASIC for the Fluke 1722A Instrument Controller. The program assumes the DMM ADDRESS switches are set to address 3.

```
1!  THIS EXAMPLE SELECTS VDC (F1), AUTORANGE (R0), SLOW READING RATE (S0),
2!  AND EXTERNAL TRIGGER WITH REAR PANEL TRIG DISABLED AND DELAY ENABLED (T2).
3!  THE CONTROLLER IS A FLUKE 1722A.  THE DMM IS SET TO IEEE-488 ADDRESS 3.
4!  THE PROGRAM TAKES ONE READING AND THEN STOPS.
10  INIT PORT 0                          !CLEAR INTERFACE (SENDS IFC)
20  CLEAR PORT 0                         !CLEAR DMM TO POWER-UP STATE (SENDS DCL)
30  PRINT @3, "F1 R0 S0 T2 ?"            !CONFIGURE AND TRIGGER DMM
40  INPUT @3, R                          !GET DATA FROM DMM
50  PRINT R                              !PRINT DATA ON 1722A SCREEN
60  END
```

Every controller handles IEEE-488 commands somewhat differently. If you are using a controller other than the 1722A, refer to your controller's programming manual for details. Examples using several popular controllers are given in the DMM Instruction Manual.